

Possible Timeline for STAR Spin Program

<u>RHIC RUN YEAR</u>	<u>NEW EQUIPMENT TO BE COMMISSIONED</u>	<u>STAR/RHIC SPIN MEASUREMENTS</u>
<i>FY04</i>	<i>New AGS warm snake; H gas jet; rf spin flipper; BEMC preshower; EEMC SMD + preshower; completed FPD</i>	<i>Test \mathcal{L} improvement schemes; calibrate P_{beam} to 10%; continue $A_{LL}(jets)$</i>
<i>FY05</i>	<i>New strong AGS cold snake; Completed BEMC, EEMC (incl. postshower); forward hadron calorim't'r?</i>	<i>Calibrate P_{beam} to 5%; improve \mathcal{L}; Collins frag. with forward p^0's; more $A_{LL}(jets)$; first look at g^+jet</i>
<i>FY06+07</i>	<i>Whatever is needed to achieve full design \mathcal{L} and P_{beam}; $\sqrt{s} = 500$ GeV pol'd collisions; STAR TOF barrel</i>	<i>$A_{LL}(g^+jet)$, transversity measurements at mid-rapidity, at $\sqrt{s} = 200$ GeV</i>
<i>FY08+09</i>	<i>Improved STAR forward tracker ($1 < \eta < 2$)</i>	<i>$A_{LL}(g^+jet)$, $A_L(W^\pm)$ at $\sqrt{s} = 500$ GeV</i>

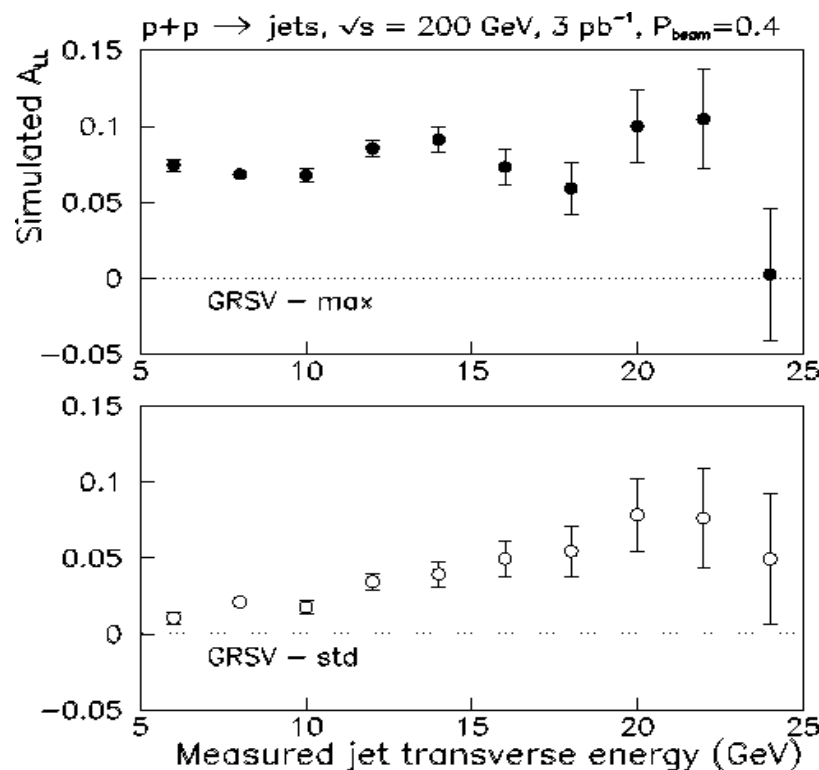
S.Vigdor, *Spin Physics from STAR*

4th Circum-Pan-Pacific Symposium on High Energy Spin Physics, Seattle (8/2003)

Inclusive jet production



- A_{LL} sensitivity (incl. detector effects)



- Simulation based on Pythia including trigger and jet reconstruction efficiencies
- Assume: Coverage of EMC (barrel)
 $\Rightarrow 0 < \Phi < 2\pi$ and $0 < \eta < 1$
- Jet Trigger: $E_T > 5 \text{ GeV}$ over at least one "patch" ($\Delta\eta = 1$) \times ($\Delta\Phi = 1$)
- Jet reconstruction: Cone algorithm (seed = 1 GeV, $R = 0.7$)
- Luminosity: 3 pb^{-1}
- Polarization: 0.4
- $\sqrt{s} = 200 \text{ GeV}$

Recent report from the competition at CERN...

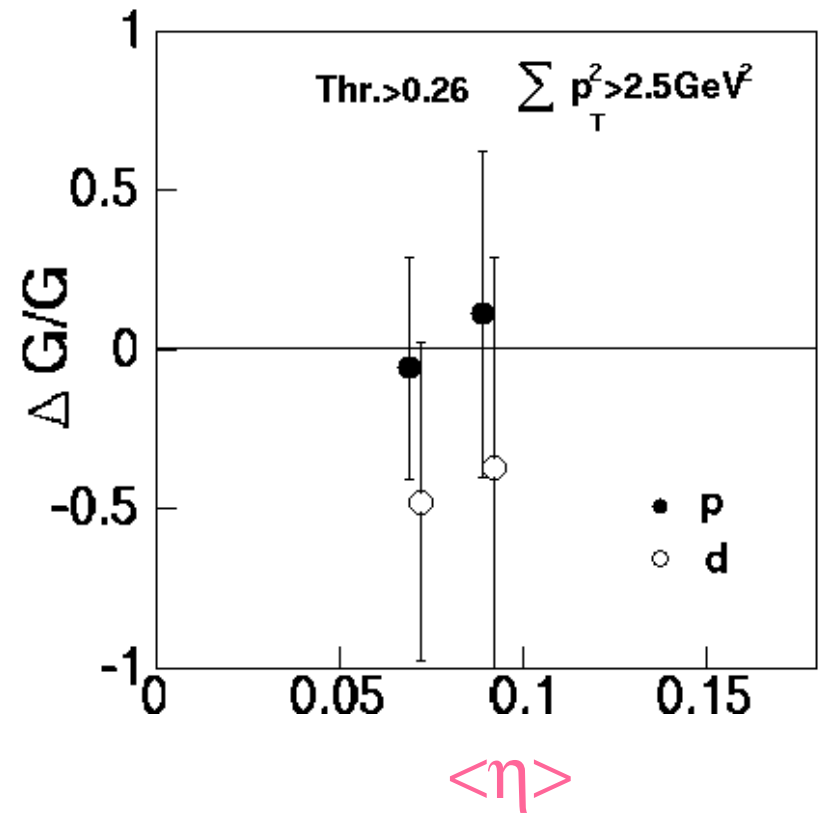


Conclusion and outlook

- 2002 run: 1.2 fb^{-1} long. + 0.3 fb^{-1} trans.
- Phase 1 setup fully operational
- Preliminary results for:
vector mesons, L polarization, transversity
- Prospects for $\Delta G/G$ in 2004 (based on 2002 stat):
- $\rightarrow d(DG/G)_{\text{stat}} \sim 0.15$ for high p_T events $Q^2 > 1 \text{ GeV}^2$
(~ 0.05 for all Q^2)

Gluon polarisation

$\Delta G/G$ determined for a given fraction of nucleon momentum carried by gluons η



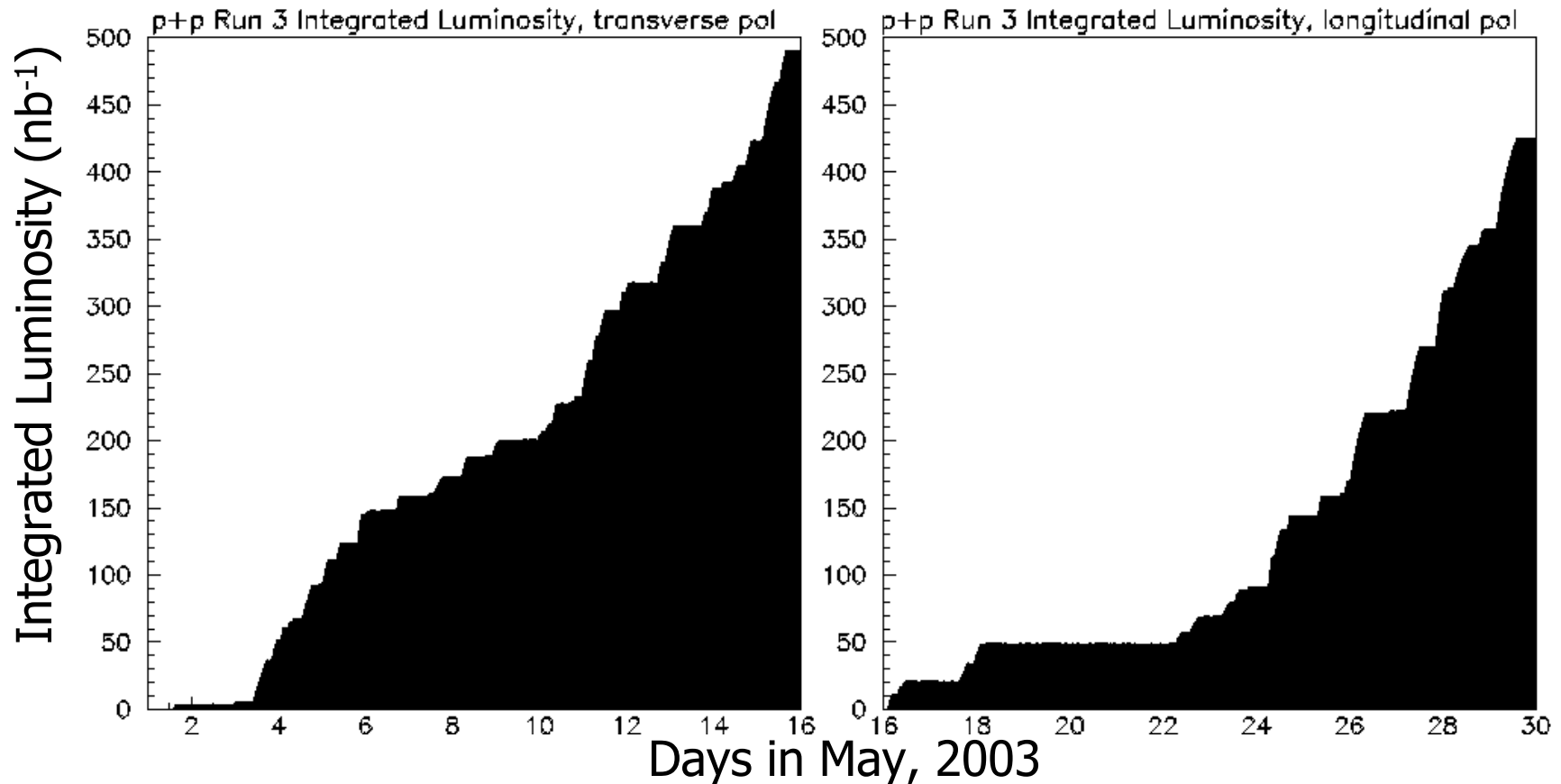
Selection	$\Delta G/G \pm \delta(\Delta G/G)_{\text{stat}}$	$\langle \eta \rangle_{\text{genPGF}}$
$\sum p_T^2 > 2.5 \text{ GeV}^2$	-0.07 ± 0.40	0.09
NN > 0.26	-0.20 ± 0.29	0.07

K.Kowalik, SINSWarsaw

(SMC) Determination of the gluon polarization.

Xth Workshop on High Energy Spin Physics, Dubna (9/03)

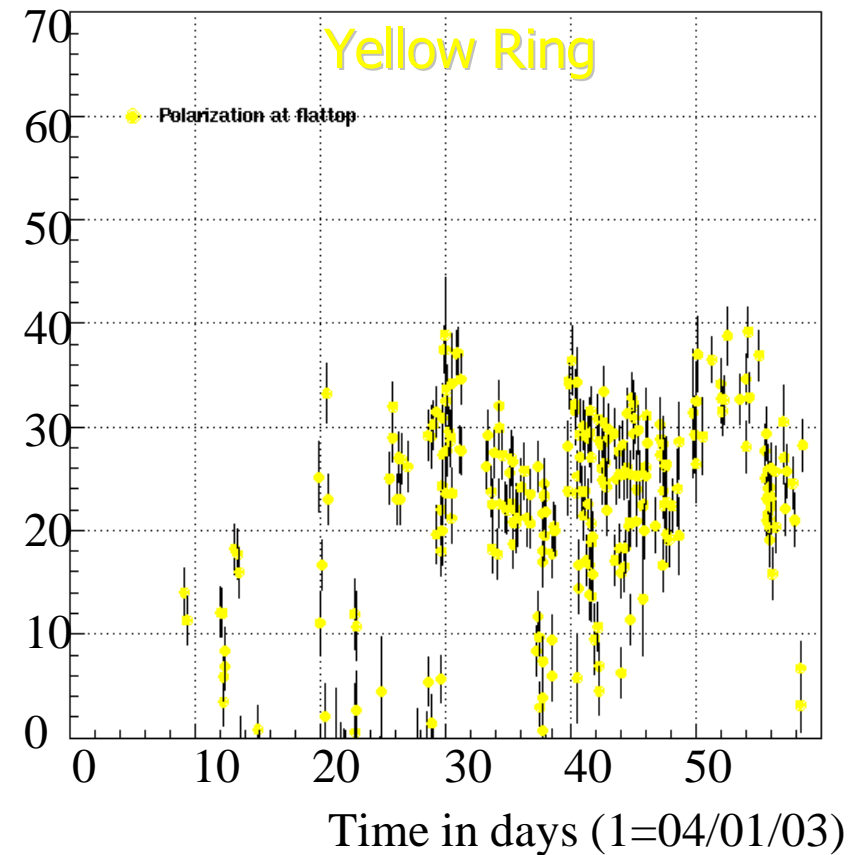
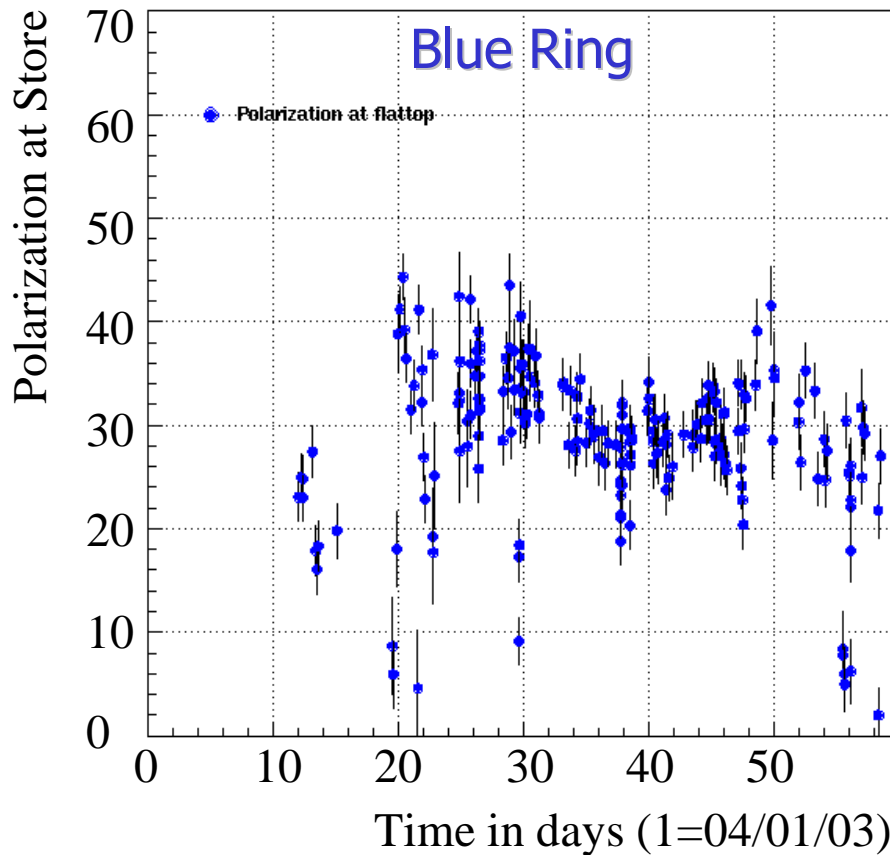
p+p Integrated Luminosity for Run 3 Delivered to STAR IR



Integrated luminosity from STAR BBC, selected on signal:background > 3

Delivered luminosity limited by 'beam-beam tune shifts' but should be adequate to accomplish physics goals from Run 3.

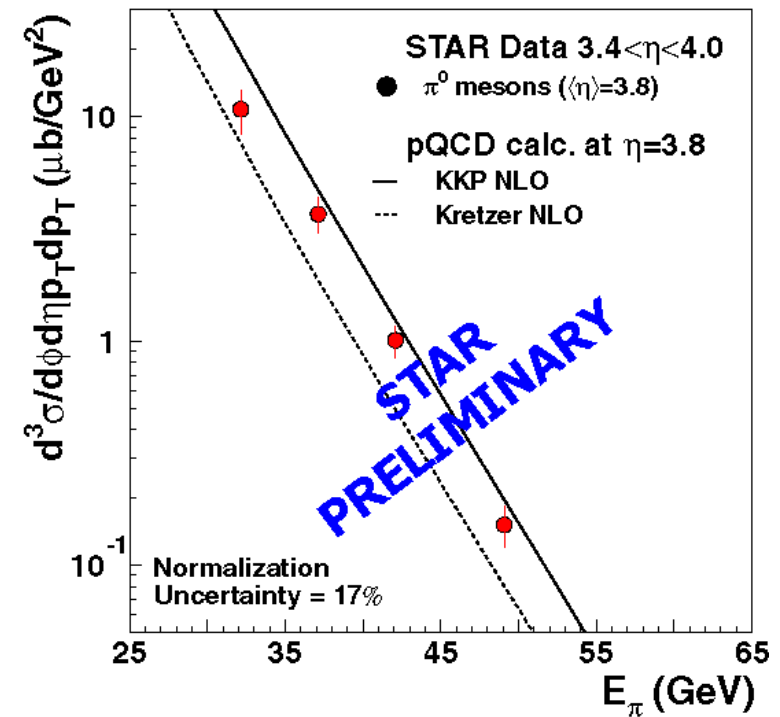
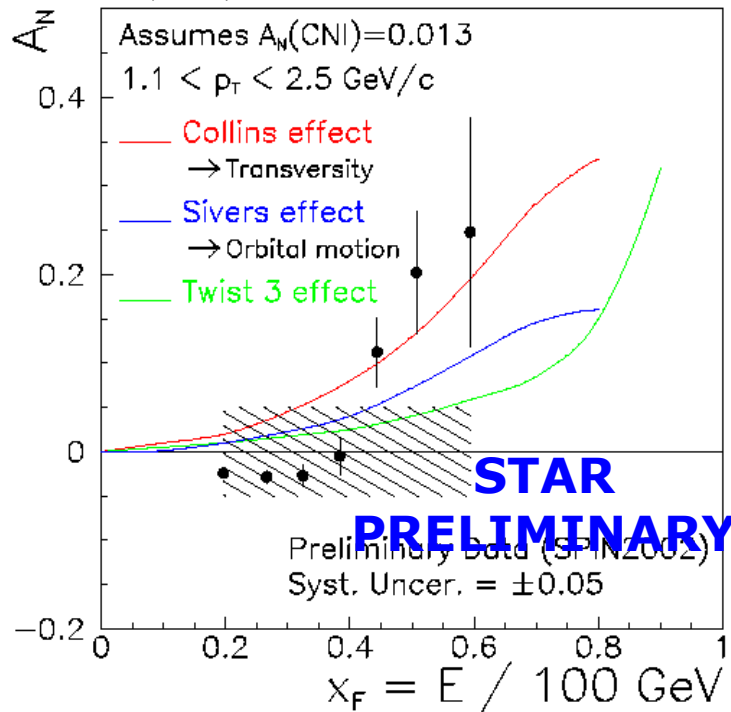
RHIC Polarization at store for Run 3



- RHIC polarization improved by factor of ~ 2 compared to run 2
- Yellow ring affected by problem with snake magnet (failure of inner helical windings of Yellow ring magnet).

STAR Spin Results: Forward Pion Asymmetry and Cross Section

$$p_{\uparrow} + p @ \pi^0 + X, \sqrt{s} = 200 \text{ GeV}$$



- Measured cross sections consistent with pQCD calculations.
- Large spin effects observed for $\sqrt{s} = 200 \text{ GeV}$ pp collisions, qualitatively consistent with models extrapolating from FNAL E704 data at $\sqrt{s} = 20 \text{ GeV}$.
- Still have large normalization uncertainty on measured A_N , to be reduced when P_{beam} calibration exp't is done.

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Towards Disentangling the Dynamics...

- Partial reconstruction of the forward jet may be possible for run-3 data by exploiting the overlap of the STAR Forward π^0 Detector (FPD) and Forward Time Projection Chamber (FTPC). Full reconstruction of forward jet will likely require the addition of hadronic calorimetry to supplement FPD. \Rightarrow Do jets have large A_N ? Is the large A_N correlated with the Collins angle (azimuthal angle between π^0 and jet thrust axis?)
- Are large, and opposite sign, analyzing powers observed for large x_F π^+ and π^- production? (Natural BRAHMS measurement)
- What happens at $\sqrt{s} = 500$ GeV?

